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RECLAMATION

ERA

A WATER REVIEW QUARTERLY



RECLAMATION *era*

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COVER. This young lady, perched atop a pumpkin outweighing her by 100 pounds, knows that fall, especially Halloween time, wouldn't be the same without the bright orange fruit.

United States Department of the Interior

Rogers C. B. Morton, Secretary

Bureau of Reclamation, Ellis L. Armstrong
Commissioner

Issued quarterly by the Bureau of Reclamation, United States Department of the Interior, Washington, D.C. 20240. Use of funds for printing this publication approved by the Director of the Bureau of the Budget, August 14, 1969.

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Price 45 cents (single copy). Subscription price: \$1.50 per year (50 cents additional for foreign mailing).

COMMISSIONER'S PAGE

Water—Our Horn of Plenty

Fall has traditionally been the time to appreciate the horn of plenty; with the increasing scarcity of our most precious natural resource—water, today we not only appreciate the cornucopia, but the water that made available the food that fills it.

As in the past, we are faced with the problem of how best to use water. The cornerstone of western water law—appropriation by right of beneficial use—was laid down more than a century ago by Brigham Young when he told his followers in the pioneer settlement of Salt Lake Valley that no man should take more water than he needs to make productive the land on which he and his family live.

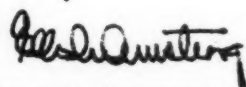
This was a sharp contrast to the long-established belief held by some landowners that every riparian had a right to the water flowing past his doorstep to do with as he chose.

The latter theory was based on the assumption that there was plenty of water for everyone and that rivers would be useful as they continued to flow into the sea, regardless of how the water was used enroute.

Changing circumstances, particularly the pressures of a growing population and an advancing civilization, have demonstrated that neither concept is totally adequate to meet today's needs, much less those of the future. Nevertheless, they are the cornerstones upon which we can and must build if we are to fulfill our responsibilities to future generations.

There must be adaptations. There must be flexibility in management to meet competitive needs. Above all, there must be responsibility to protect and use the available water supplies in the most efficient manner possible to fulfill all requirements. This refers not only to water needed for municipal, industrial and irrigation uses, but for fish and wildlife uses as well.

As we can see, the responsibility to achieve this falls upon the shoulders of all water users. If we are able to use water in the most efficient manner possible, we will insure that America's cornucopia will always be full.



ELLIS L. ARMSTRONG
Commissioner of Reclamation

Trick-or-Treat and Reclamation

This farm owner unsuccessfully tries to lift a huge pumpkin weighing over 100 pounds.



Top: Grown in the San Joaquin Valley, this Turbine Squash, despite its unique shape, is sometimes confused with pumpkin. Bottom: These pumpkins weighing only 35 pounds each, are grown on several Bureau of Reclamation projects, including the Central Valley project and the Salano project, Calif.



FEW people associate trick-or-treating with the Bureau of Reclamation, that is until they realize that Halloween would not be Halloween without pumpkins and pumpkins could not survive without water—often Bureau of Reclamation-supplied water.

Originating in tropical America, several varieties of pumpkins were known to the Indians at the time of our early colonization. Today they are grown in nearly all parts of the United States, since their low nutrient requirement enables them to grow in well-limed and well-drained soils throughout the temperate zone.

Inconsistently referred to as pumpkins and as squash, the quick-growing, small-fruited bush or nontrailing varieties are called squash in America, while the long-season, long-trailing, large-fruited varieties are called pumpkins. The very largest varieties of pumpkin are more properly designated Winter Squash and may weigh 100 pounds or more. Other varieties are Sweet Cheese, Japanese Pie, Kentucky Field, Green Striped, to name only a few.

Turbine Squash, sometimes confused with certain varieties of pumpkin, is also shown here. So named because of its appearance, this vegetable is just one of the many agricultural products grown in west San Joaquin Valley. Irrigation water for the farmers in this area is supplied by the San Luis Unit, built by the Bureau.

These pumpkins, grown on the Bureau's Central Valley project, Calif., are stacked and ready for sale on a roadside market near Turlock, Calif. This area is part of the more than a million acres of fertile land receiving water from the project and producing annually more than \$300 million worth of crops.

Fairly rich in carbohydrates and minerals, especially phosphorus, calcium and iron, pumpkins are raised between hills of corn or in fields by themselves in hills 8 to 10 feet apart. The American mammoth varieties are used for exhibition and stock feed while field and sugar pumpkins are used for pies and canning.

Other uses for pumpkins and squash include oil recovery from the vegetables' seeds and also a nutlike delicacy made by roasting and salting seed kernels.

Whether decorating a window with a lighted jack-o'-lantern or sampling a freshly baked pumpkin pie, each of us has enjoyed another agricultural product made possible by Bureau of Reclamation water. # # #



by LILLIAN TANGEN, Former Writer-Editor,
Johnny Horizon,
Washington, D.C.

Johnny Horizon

"Johnny Horizon, where do you go from here?
I'm on my way to a better day
Where the air is clean and the water is clear.
Johnny Horizon, may we come along with you?
If you come along, it's more than a song—
We've got a lot of work to do."

"Johnny Horizon" words and music
by Randy Sparks (ASCAP)

THE Johnny Horizon program celebrated its fourth birthday in July and it's fair to say "a lot of work" has already been accomplished by Johnny's many partners.

As a positive environmental action program, the Johnny Horizon program depends upon direct citizen involvement. Since its birth in 1968, it has involved thousands of volunteers in every state of the Nation, as well as in American Samoa. This year alone, requests for information have come from such distant points as Australia, Nigeria, and the Netherlands.

Johnny Horizon '76

Johnny's reception has been so successful that this fall the program was expanded to launch a campaign entitled "Johnny Horizon '76." With the message, "Let's clean up America for our 200th birthday," the campaign aims at uniting government at all levels, business and industry, and pri-

vate citizens in an effort to restore the natural beauty of our land by 1976—an accomplishment which certainly would give added meaning to our Bicentennial celebrations. Clean-up projects are encouraged by the Johnny Horizon programs in major urban centers across the Nation.

New program materials—many in patriotic red, white and blue—include a number of interesting tidbits for urban dwellers: booklets on rat control and recycling centers, information sheets containing eco-tips that concerned individuals of all age groups can follow to fight pollution and to develop environmental awareness.

Johnny represents to his supporters the thoughtful user of the environment. He is a volunteer. He wears no badge or uniform and enforces no law. He is a man of the land who is concerned with preserving the scenic beauty of America and with the dangers to public health and safety created by careless pollution.

He is concerned also with the heedless waste of our natural resources. In short, he speaks to the

best in all of us. As the impact of the program increases each year, Johnny Horizon is fast becoming for pollution what Smokey Bear is for forest fires.

Johnny Horizon and the Bureau

Johnny and the Bureau of Reclamation have worked hand-in-hand on several projects to protect and to cleanse our environment.

In many of the Bureau's regions, old and young alike have pitched in to help remove litter along highways, garbage from fields and rural areas, and trash from recreation spots. Even scuba divers have taken part to clear rubble from streams and lakes.

Boy and Cub Scouts from New Mexico did their part during a cleanup campaign last spring by loading trash onto trucks. The land around the Navajo Indian Irrigation project (in the Bureau's Upper Colorado Region, but responsible to the

Boy Scouts from Troop 322 and Cub Scouts from Pack 322, Farmington, N.M. load trash into trucks during a cleanup campaign.





Top: Scuba divers played an important part in the cleanup project in American River, Calif.



Center and Bottom: Boy Scouts and 4-H Club girls from Boulder City assist Bureau of Reclamation employees from the Lower Colorado Regional office in Nevada.



Southwest Region) has been enhanced by their efforts.

Over 200 scuba divers made fine catches in the American River, below Nimbus Dam, on the Central Valley project, Calif. However, their catches were not pike, bass, bluegill or trout. Instead, they were rusty beer cans, rotted tires, strips of metal, and an old hub cap or two.

Other boosters of the Johnny Horizon program are Bureau of Reclamation employees of the Regional Office in Boulder City, Nev. They, with the help of 4-H Club girls and Boy Scouts, spent 120 hours removing 11 pick-up truckloads of litter near Boulder City and the Lake Mead National Recreation Area.

Johnny Horizon's Beginning

The program was launched officially by the Bureau of Land Management (BLM) in June



Before: Vista Site on old Highway 40 at Donner Summit, Nev. is bordered by defaced rock—as it looked prior to the invasion of over 400 Boy Scouts from the Tahoe Area Council.

During: These boys, as part of the Department of Interior's Johnny Horizon cleanup campaign, spent many hours grouting the rock. **After:** Presto! The eyesore is gone.





Headed by Burl Ives, many members of the entertainment industry have given their time and talent to promote the Johnny Horizon program.

1968 to create public awareness of a problem BLM had been facing for over 10 years—the increasing pollution of public lands by careless littering and vandalism.

In 1967 the estimated costs of a one-time cleanup campaign were staggering, and BLM recognized that such a project wouldn't be a satisfactory long-term solution to the situation.

A program was needed that would "turn on" the public, a program that would inform people of the pollution problem and involve them in doing something about it. It would be a do-it-yourself environmental program in which individuals or groups might participate.

The program was the first effort by the Federal Government to involve citizens in a way that President Nixon stressed in his first environmental message when he asked for "millions of helping hands."

Johnny began as a Westerner, because BLM lands are located primarily in the West. He looked like a typical outdoorsman—broad-brimmed hat and all. His reception and effectiveness in the West were so great the Tennessee Valley Authority, U.S. Army Corps of Engineers, and the U.S. Postal Service soon gave their support to the program.

Congress even passed legislation protecting the use of the name and symbol and authorizing the Department of the Interior to license the use of Johnny Horizon for commercial purposes. Royalties from these licenses are reserved for the program and allow Johnny to function on fewer tax dollars. A Licensing Committee was established to screen applicants to insure that products bearing the program's name and symbol maintain its goals.

Licensed Products

Among the licensed products, one of the most exciting is a kit for testing water and air pollution. It is produced by Parker Brothers, producers of the game, "Monopoly." The kit promote environmental education.

With the help of the Johnny Horizon Classroom Kit, school children and youth groups participate in projects which increase their awareness of the environment and stimulate involvement in sound environmental action. Educational materials prepared in cooperation with the U.S. Office of Education have been furnished to over 100,000 classrooms across the Nation. The teacher's material contains instructions which aid the

teacher in integrating environmental studies into the total curriculum.

The action arm of the program involves thousands of volunteers in environmental improvement and cleanup campaigns each year, such as those sponsored and organized by the Bureau of Reclamation.

Otherwise, to attain the results of these efforts would have cost millions of dollars if undertaken by local, State, or Federal governments. Of greater importance, however, is that they have involved millions of citizens in doing something positive about pollution—of caring for their own earth household.

Sponsors of these campaigns have ranged from hobby and scouting groups to school systems and chambers of commerce. Commercial cosponsors are encouraged to share production and distribution costs of promotional materials and litter bags.

Celebrities Help, Too!

Members of the entertainment industry, headed by Burl Ives, have rallied to help promote the Johnny Horizon program through personal appearances, records, and radio and TV public service announcements.

Celebrities who have participated include Sonny and Cher, Dinah Shore, Carol Burnett, Johnny Cash, Glen Campbell, Henry Gibson, Ed McMahon, Randy Sparks and the Back Porch Majority, Karen Blackwell, Eddy Arnold, Shari Lewis, Ed Ames, Joe Campanella, and Adam West. Johnny's newest partner, Snoopy—star of Charles Shultz's comic strip, "Peanuts"—daily attracts new supporters to the program.

Departmentwide

In July of this year, the Johnny Horizon program gained stature when its administration was transferred from the Bureau of Land Management to the Office of the Secretary. Plans for use of the program by all Departmental bureaus, as the Bureau of Reclamation has done, are now being developed.

Success has not gone to Johnny's head, nor has expansion caused him to lose sight of his goal first voiced in 1968. He is as sincere as ever in saying, "This land is your land—keep it clean."

With increasing program support, it is possible to believe the "better day" described in Johnny's song may be somewhere just around the corner.

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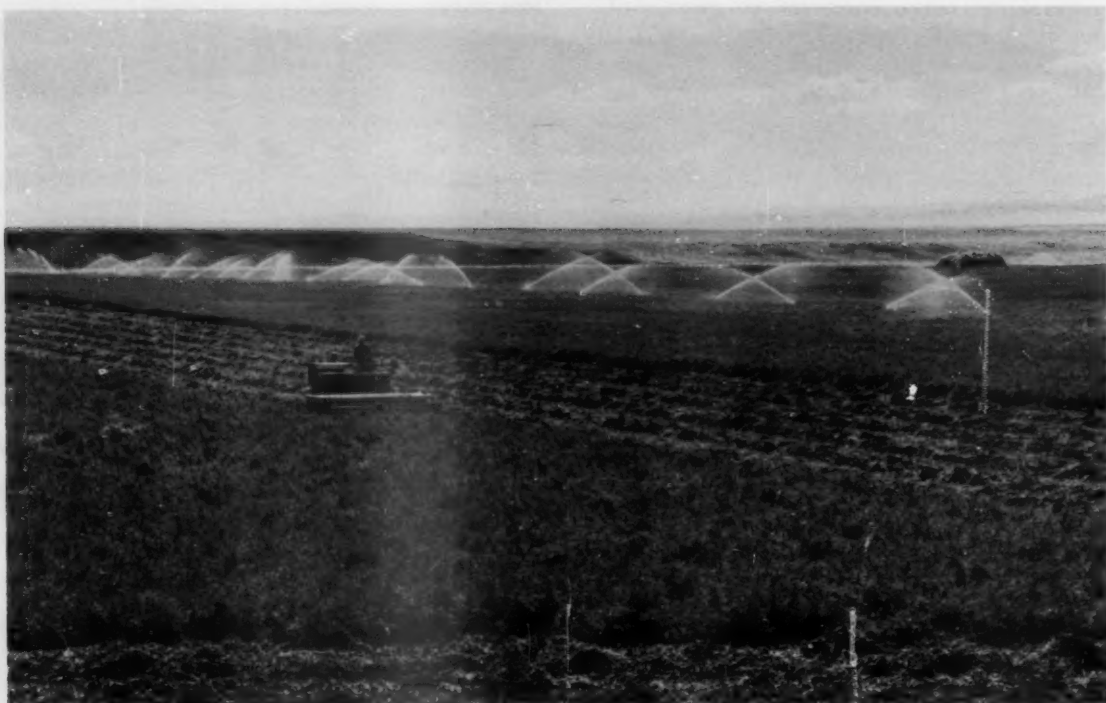


The East Bench Environment

by **HAROLD E. ALDRICH**,
Regional Director, Bureau of Reclamation,
Billings, Mont.

LONG before the explosive impact created by the Environmental Protection Agency in 1969, construction on the East Bench Unit of the Pick-Sloan Missouri Basin had begun in 1961. At that time the Bureau of Reclamation was not required to prepare or file an environmental impact statement.

Even though the Bureau was not required to prepare a statement, it has been aware of the sometimes adverse factors connected with water resource development. But these factors are balanced or outweighed by adapting resources to the needs, aspirations and potentials of people which advance the interest of man and nature toward a productive total environment.



Sprinkler irrigation, now comprises 51 % of all irrigation on the East Bench Unit.

In planning and developing the East Bench Unit, the Bureau worked closely with agencies and local interests to protect and enhance the fishery, to provide recreation, to preserve historical sites, and to construct a project that fits in well with the total environment. Minimum flows and fish-excluding devices, for example, were included in project plans.

Old Reclamation Commercials

Although the "ecology movement" as we know it today was then beyond the wildest hopes of the most ardent conservationist, the challenge is great to listen to what someone has called "old Reclamation commercials." And so officials of the Upper Missouri Region decided to commission outside agencies to "tell it like it is."

Immediately following completion of Clark Canyon Dam in 1964, the Bureau contracted with the University of Montana to collect and analyze economic and historical information depicting conditions before project development.

The interim report was completed in 1967 when the U.S. Census of Agriculture for 1964 became available. A second analysis depicting conditions after project development is scheduled when the 1974 Census of Agriculture data are available.

The Bureau also contracted with the Montana Fish and Game Department for a fishery evaluation of Clark Canyon Reservoir and Beaverhead River, scheduled for completion in 1974.

But time, tide, as well as environmental and economic impacts, wait for no man. Consequently, an interim observation of the more obvious changes in the community since water first became available can provide a "sneak preview" of the disciplinarian's view and computer's linear and curvilinear relationships which will come later in the fulfillment of our contracts.

Early Need for Irrigation

Because the people of Beaverhead River Valley were aware of the need to solve their problems, and because they had the courage, persistence, and

tenacity to do so, the water which otherwise would not be used, benefited the entire valley.

The people of this region realized the need for irrigation shortly following the famed Lewis and Clark expedition which reached the valley in 1805. Nearly as long as the area's history of development were its disputes, debates and legal actions over water rights.

The first water right for irrigation of land in the Beaverhead River Valley was established in 1865, and the diversion of water from the river for irrigation purposes developed rapidly. Dry farming was undertaken in earnest after passage of the Enlarged Homestead Act of 1909. Settlement was encouraged, but the low rainfall and short growing season combined to discourage dryland farming operations.

Livestock Ranching

Livestock ranching became the predominant agricultural pursuit. Ranchers used all available water resources for irrigation, occasionally diverting the entire flow of the river. However, without

storage, little additional acreage could be irrigated adequately. The dryland area, predominantly the benchlands above the valley, were sparsely vegetated with native grasses and were used primarily for grazing.

Many water users in the valley and owners of the dry benchland were dissatisfied with the status of irrigation water supplies in the area and exerted considerable effort to alleviate the complicated water supply situation.

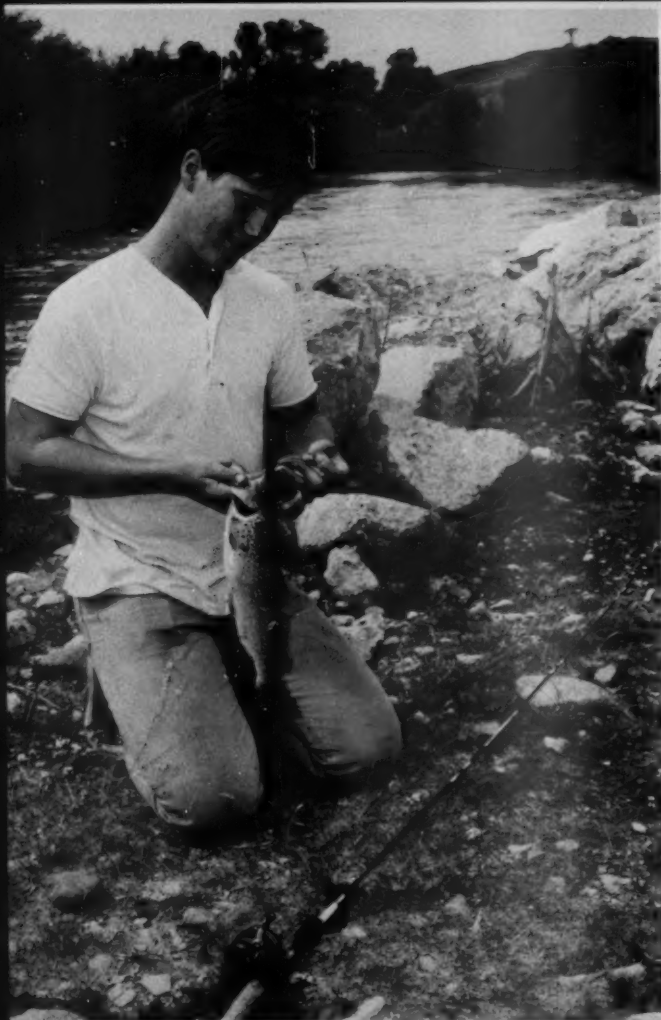
Several damsite drillings were made, but the engineering skills and money available were not adequate to complete the job. Eventually the erratic nature of unregulated streamflow, disputed water allotments, inability to follow long-range farm plans, and declining productivity resulting from inefficient irrigation practices combined to produce demands for positive actions leading toward a solution.

Water Problem Is Solved

In 1964, the water supply problem was finally solved by diplomatic trade-offs and sharing in

Fields of grain like this field of oats benefit from water from the Clark Canyon Dam.





Tim Winger carefully removes a lure from a large trout he landed at Barretts Diversion Dam on the Beaverhead River between Clark Canyon Dam and Dillon, Mont.

which the Bureau, the landowners, and community leaders cooperated. At that time, just a few months short of one hundred years since the filing of the first water right in Beaverhead Valley, the East Bench Unit of the Pick-Sloan Missouri Basin Program reached completion.

30-Mile-Long Unit

The unit in Beaverhead and Madison Counties, is approximately 30 miles long, from $\frac{1}{2}$ to $7\frac{1}{2}$ miles wide, and follows the northeastern course of Beaverhead River Valley and adjacent benchlands. The town of Dillon is within unit boundaries. Irrigation water storage is provided by

Clark Canyon Dam, just below the junction of two streams—Red Rock River and Horse Prairie Creek—which join to form the Beaverhead River.

The East Bench development began as a part of the comprehensive, unified and multiobjective plan conceived to meet the special needs of the Missouri River Basin and, indirectly, the entire Nation. The objective of the Pick-Sloan Missouri Basin Program is to make the best and most efficient use of the water and related land resources of the Missouri Basin. This plan played a decisive role in the development of the East Bench Unit.

As It Looks Today

Clark Canyon Reservoir (Hap Hawkins Lake) first stored water in 1964. Since that time, it has prevented \$1,255,000 in flood damages. Recreation visitation is increasing by leaps and bounds. An adequate flow has been maintained in all reaches of the river to sustain fish life, whereas prior to the construction of the dam, lack of water in several reaches of the river resulted in fish kills and limited fishing opportunities. The reservoir has annually furnished an adequate irrigation supply to the 21,800 acres of new lands and 28,000 acres of supplemental supply lands. Before the reservoir was completed, the supplemental supply lands often experienced severe shortages.

Flood Control

East Bench Unit flood control benefits are derived from the protection given municipalities of Beaverhead River's flood plain (primarily Dillon), rich farmlands and irrigation developments adjacent to the river, and roads and railroads that cross the river or flood plain. Although it was estimated that flood control benefits would be \$123,000 annually, above-average runoff from the Beaverhead drainage basin resulted in the above-average total benefits of \$1,255,000 reported by the Corps of Engineers for the 7-year period ending in 1971.

Installation of sprinkler irrigation systems, land leveling, and drainage speeded conversion from dryland to irrigation farming. The major impetus has been the introduction of sprinkler irrigation. By 1971, sprinkler systems served 49 percent of the lands.

An irrigation specialist, assisting the Bureau under contract with the Montana Cooperative Extension Service, also helped convert the East Bench Unit from dryland to irrigation farming.

During the early stages of development, the irrigation specialist provided farmers with information on modern irrigation practices; irrigation scheduling; improved varieties of grasses, alfalfa and grains; and established demonstration plots depicting effective water management and the value of proper fertilization.

Assistance was also provided to supplemental water users faced with the need to change from preproject irrigation practices based on a partial water supply to the conditions of a full season water supply controlled by releases from Clark Canyon Dam.

Prior to construction of the East Bench Unit, Beaverhead Valley had a small hay supply for winter feed. This shortage resulted in restricted herd sizes and less-than-optimum use of surround-

ing grazing lands. Because of the increased production and assured supply of alfalfa hay and feed barley, not only have the numbers of range livestock increased, but calf wintering and feedlot operations are more numerous, permitting more advantageous marketing.

Several new feedlots were constructed in 1968 and presently are in operation. Malting barley, an excellent cash crop, was marketed for the first time in 1968, with about 2,500 acres under contract in 1971. Irrigated pastures properly fertilized and watered have produced a reported 600 pounds of beef to the acre.

The following table shows acreage and crop production records between 1965-71, following completion of the project in 1965. Particularly interesting is the rapid development of new lands; 85 percent of the unit was producing within 3 years. These figures do not include livestock or livestock products. (Notice the great increase in total crop value in just six years.)

The Beaverhead public-use area is used by numerous visitors each year.



**EAST BENCH UNIT—PICK-SLOAN MISSOURI BASIN
PROGRAM (21,800 IRRIGABLE ACRES—SUPPLEMENTAL
28,004)**

Year	Acres irrigated		Total crop value—Dollars	
	Full	Supplemental	Full	Supplemental
1965	8,491	NA	279,780	NA
1966	16,307	27,104	549,651	1,545,249
1967	18,750	27,090	946,765	1,280,708
1968	20,274	27,090	1,005,977	1,097,478
1969	20,806	27,090	1,457,453	1,310,420
1970	20,941	27,090	1,512,405	1,602,305
1971	21,012	27,090	1,722,372	1,729,428
			7,474,303	8,565,588

Recreational Areas

Two primary recreational areas exist in the East Bench Unit: Clark Canyon Reservoir and Barretts Diversion Dam. The diversion dam area is used by the public primarily as a fishing area, while at the reservoir, outdoor recreation enthusiasts enjoy picnicking, camping, swimming, fishing, boating, sightseeing, etc. To date only basic health and safety facilities have been provided for the public at both areas.

Visitation increased from 27,000 in 1965, the year the reservoir was filled, to 40,000 in 1971. With full development as anticipated under the Federal Water Project Recreation Act, it is expected that visitation will more than double in the foreseeable future.

Fishing Enhanced

Fishing has been excellent in Clark Canyon Reservoir and is outstanding downstream in the Beaverhead River. Sport fish in the area include rainbow and brown trout and mountain whitefish. Local sportsmen say fishing in the Beaverhead River, which was notable, has improved since completion of Clark Canyon Dam.

Prior to construction of Clark Canyon Dam, fishing was limited to the river upstream from Dillon, Mont., but fishing opportunities now extend approximately 30 river miles downstream from Dillon.

Sportsmen have attributed the development of this fishing to the storage of floodflows behind the dam thus maintaining minimum flows in all stretches of the river throughout the year, yet still meeting other project needs. Acknowledging both the bad and good, unavoidable high flows

have occasionally interfered with fishing in the stretch between Clark Canyon and Barretts Diversion Dam.

Tom Wendelburg, author of an article on fishing in the Beaverhead in the January 1972 issue of *Field and Stream*, quotes Ron Marcoux, a Montana Fish and Game biologist,

"It's hard for anglers to comprehend the great numbers of wild trout in the small Beaverhead. The river hasn't been stocked with browns since 1954 or with rainbows since 1960, but anglers at this time aren't even scratching the Beaverhead's trout population."

Total season take as indicated by reports of the Montana Department of Fish and Game have shown significant and steady increases in the Clark Canyon area since completion of the dam. In 1965 only 0.3 fish were caught per fisherman visit. This figure increased to 1.9 in 1968, 3.8 in 1970, and 5.3 in 1971. The number of fishermen visitations has more than doubled since 1965, while during the same period total annual sport fish catch increased by more than 37 times.

Fishery Rehabilitation Program

The original plan for East Bench Unit provided \$140,000 for a fishery rehabilitation program, but later studies and experience showed this program would be unnecessary. Instead, much of the money is being used to help finance a 5-year fishery evaluation study being made by the Montana Fish and Game Department.

To learn more about the influence of dams on cold-water fisheries, both within reservoirs and in the rivers upstream and downstream, is the goal of this study. Interestingly, recent reports from the researchers performing this study indicate there are far greater numbers of trout in the Beaverhead River below the dam than had been anticipated.

Goose and duck hunters also enjoy use of the reservoir area. There were 450,000 duck use days and 15,000 geese use days at the reservoir in 1971.

And one final note—an industrial water supply contract providing a maximum of 175 acre-feet annually is making possible the operation of a mineral beneficiation plant which grinds talc for ceramic, paint and cosmetic industries and provides employment for about 56 full-time employees.

#



NORTH DAKOTA GOOSE HUNTING

“geese on the horizon!”



Flocks of geese, out for early-morning feeding, are tempted by the unthrashed millet field below. A hunter in a pit blind soon discourages the flock, but not before two birds fall to the marksman.



This hunter calls to a flock of geese from an improvised blind on a rockpile near his decoys.



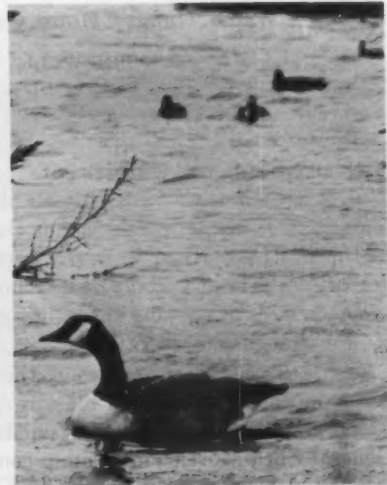
Young Scott Anderson seeks approval from hunting companion Roger Master.



A successful hunt, no doubt about it!



Canada geese and ducks enjoy the protection of the Audubon National Wildlife Refuge.



"GEESE on the Horizon!" Each fall these words are echoed over and over again by an army of goose hunters huddled in their pits and blinds on the North Dakota prairies, waiting in the cold dawn for the first flight of geese.

Located on the Missouri Flyway, North Dakota's lush grain stubble fields and water areas attract hundreds of thousands of geese during their annual fall migration from Canadian nesting areas to their winter homes to the south. Blue, Snow and Canada geese are the predominant species, with other species in lesser numbers.

The State's goose population usually peaks in mid-October and continues through November or until the water areas freeze over or snow covers the stubble fields. During this period, hunters invade their favorite goose areas, filling hotels, motels,

campgrounds and eating places—creating a carnival atmosphere in the small prairie towns.

The Bureau of Reclamation's Garrison Diversion Unit, now under construction, will straddle the prime goose areas in the State. Included as part of the unit, approximately 110,000 acres of migratory waterfowl areas will be acquired and developed with an assured and controlled water supply. Scattered throughout the unit, the waterfowl areas will be managed as public shooting areas by the U.S. Bureau of Sport Fisheries and Wildlife and the North Dakota Game and Fish Department.

With the number of hunters increasing each year and a decreasing land area available for public hunting, the waterfowl areas created by the Garrison Diversion Unit will provide new and badly needed hunting areas for the public. # #

Yesterday

in Our Magazine

THE RECLAMATION ERA—1950

Watch Hungry Horse Grow

by JACK CRISWELL,
Chief Special Services Division,
Hungry Horse project, Mont.

IN 1950, Hungry Horse begins to take shape. Construction of this big multiple-purpose Bureau of Reclamation project on the South Fork of the Flathead River in northwestern Montana, featuring the biggest concrete dam now being built in the world, has swung into high gear after the winter shut-down.

In the two construction seasons that have passed since the first construction blast reverberated between the steep canyon walls on July 10, 1948, General-Shea-Morrison, prime contractor, has completed the big job of excavating more than 1,000,000 cubic yards of earth and rock in preparing bedrock foundations for the dam and power-plant, and has erected one of the most efficient and up-to-date concrete production plants ever developed.

Climax of this first phase of the tremendous job of constructing the world's third highest (564 feet) and fourth largest (3,000,000 cubic yards) concrete dam came on September 7, 1949, when the first bucket of concrete was placed in the base of the dam. Racing against time, G-S-M placed a total of 59,554 cubic yards of concrete last fall before cold weather halted concrete operations for the winter.

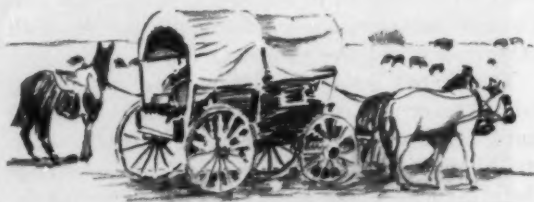
When the dam is completed, it will back the waters of the South Fork into a 34-mile-long lake, 3½ miles wide at the widest point, with a storage capacity of 3,500,000 acre-feet.

By the time the Hungry Horse project is com-



Hungry Horse Dam, May 22, 1952: General view of the dam.

pleted in November 1953, the mixing plant will have turned out enough concrete to build a 20-foot highway from Seattle to San Francisco and back—the equivalent of an 80-pound piece of concrete for every man, woman, and child in the United States.



today...

EDITOR'S NOTE:

Last spring, rivers along the American-Canadian border were so full, they threatened a repeat of the 1948 flood which inundated Vancouver, Wash., and Portland, Oreg.

But, because of Hungry Horse Reservoir and grand Coulee Reservoir, floods were averted. Here is part of an account describing how Hungry Horse Reservoir prevented a disaster.

HUNGRY HORSE NEWS—MAY 19, 1972

H. H. Dam Prevents Flooding this Week

by MEL RUDER,
Editor, Hungry Horse News,
Columbia Falls, Mont.

“WITHOUT Hungry Horse Dam, the Flathead River at Columbia Falls this week would have topped flood stage.

“Flathead River at Columbia Falls reached 12.2 on the gauge with a flow of 42,950 second-feet. Without Hungry Horse Dam, the river would have topped flood stage of 15 feet when the flow is 63,700 second-feet. Inflow at Hungry Horse Reservoir averaged 24,724 second-feet Wednesday.

“Meteorologist Ray Hall at the U.S. Weather Service station, county airport, noted the Flathead River flow this week should be diminishing the flood threat. ‘Similar flow for 10 or 12 days should bring down the water without a flood.’

“Monday reading at Columbia Falls was 10.4, Tue. 11.7, Wed. 12.2 and Thurs. noon, 12.1 feet with a flow of 42,300 cubic feet per second.

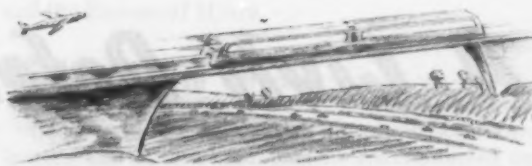
“Revised figures were received from the Weather Service river forecast center, Portland,



Drawdown at Hungry Horse Reservoir was necessary to avert floods.

Thurs. afternoon. Prediction is the Flathead at Columbia Falls will reach 11.9 Fri., 11.6 Sat., 11.1 Sun. and 10.7 Mon. . . .

“E. K. Miller, chief of the operations branch at Hungry Horse Project, said the reservoir came up nearly four feet Wednesday. Storage now tops 1,500,000 acre-feet with lake elevation 109 feet below the full mark. Record drawdown for the 34-mile long lake took place at 6 p.m. May 8, 1972. It was down 128.4 feet with storage 1,262,600 acre-feet compared to 3,468,000 when full. . . .”





***HOOVER DAM,
A Civil Defense Shelter!***



Bureau of Reclamation's world-famous Hoover Dam on the Lower Colorado River could provide food and shelter for 9,000 people for two weeks in the event of a nuclear attack.

by **MILDRED RHOADES,**
Bureau of Reclamation Regional Safety Clerk,
Lower Colorado Region

HOOVER DAM, 30 miles from popular and populous Las Vegas, Nev., and visited by more than 600,000 people per year, has been designated as a fallout shelter and is one of the largest and most important shelters in Clark County.

Clark County has a population of over 300,000 and during a weekend this total is increased by an additional 70,000 tourists. In the event of a nuclear attack, Hoover Dam would be capable of accommodating approximately 9,000 persons, by providing them food and shelter for 2 weeks.

Civil Defense Organization

As a fallout shelter, Hoover Dam is part of the Clark County Civil Defense Organization. The Clark County Civil Defense Agency with headquarters at Arden, Nev., is organized to include Boulder City, Henderson, Las Vegas, and North Las Vegas.

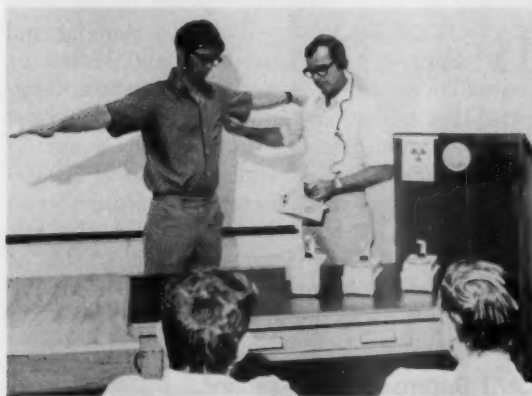
The Bureau of Reclamation provides civil defense instructors to teach radiological monitoring and shelter management. Included in the training are employees of the Lower Colorado Regional Office; Boulder Canyon project; National Park Service; Department of Water and Power, City of Los Angeles; Southern California Edison Co.; and the Bureau of Mines.

Refresher Course Offered

Basic and refresher courses in radiological monitoring and shelter management are conducted on



Above: Radiological Monitor Instructor George Neibauer conducts a class in radiological monitoring. Below: A radioactivity-monitoring demonstration is presented for the trainees.



a continuing basis at the dam for assigned personnel.

The training, conducted during working hours includes a 16-hour basic course and a 4-hour refresher course. Personnel are selected to insure that no office is deprived of too many individuals at any one time.

Radiological monitors are trained to measure radiation received in the event of fallout and thus assist in answering questions such as, "When will it be safe to leave the shelter and for how long?" George Neibauer of the Boulder Canyon project is the radiological monitor instructor.

Shelter Managers

Shelter managers are trained in the distribution and use of food, water, sanitation facilities and

Shelter Manager Instructor Donald Fisher checks survival supplies on the 9th floor of Hoover Dam which has been designated as a southern Nevada fallout shelter.



medical supplies available in the shelter. Shelter managers also learn how to cope with psychological problems that can occur in a shelter due to crowded conditions and the tension resulting from unusual living situations. Don Fisher of the Boulder Canyon project is the shelter manager instructor.

The civil defense training received by these individuals is not only available to the residents of the area in the event of a nuclear attack, but can be utilized for natural disasters such as earthquakes, floods, etc.

The Bureau of Reclamation coordinates its civil defense activities with the Clark County Civil Defense authorities. In so doing the Bureau will be able to accomplish a smooth transition from a civil defense emergency period to a period of rehabilitation and restoration subsequent to any emergency.

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WATER Quiz

- 1 A *dirhem* is a weight equal to approximately 48 grams and is used in Persia, Morocco, Turkey, etc. Billions of dirhems of water are used annually in these countries. For each letter in the word, name a use of water (for example, e = ecological).
- 2 Which of the following is *not* true of the ancient Roman civilization?
- a. They were masters of irrigation and swamp drainage.
 - b. They build elaborate pumping systems.
 - c. Mosquito abatement was partly the reason for digging canals.
- 3 Identify this object →
- a. A test soil sample
 - b. A concrete molding
 - c. An engine valve
- 4 The quantities of food available from the sea are almost unlimited. Food production from the sea can be increased to nearly 19 times that being produced today. Are these statements true or false?
- 5 If fossil fuels continue to be used principally for their energy contents, and if they continue to supply the bulk of the world's energy requirements the time required to exhaust the middle 80 percent of the resources of the petroleum family will be about a century. True or false?



Answers on page 29.

Prior to modern-day chemicals, removal of irrigation canal pondweeds was a laborous, manual job.

Restrictions on Pesticide Uses



FOR centuries man has sought to control weeds, insects and rodents. Now he is learning to control his controls.

Regulations concerning the use of pesticides are increasing. Because of this, operation and maintenance personnel on Reclamation projects are faced with increasing problems as they carry out their difficult task of controlling pests along canal systems, reservoir areas, power transmission lines and on other Government-owned lands.

Executive orders require full compliance with all State and Federal anti-pollution regulations at Federal facilities and on Federally-owned lands, including the restricted use of pesticides. The Secretary of the Interior has issued guidelines to implement Presidential directives for pollution control and environmental enhancement.

Must Approve Pesticide Proposals

Departmental policy includes the requirement that each Federal agency's proposals for pest control must be approved yearly, prior to their implementation. Approval must be given by the Federal Working Group on Pest Management, which is responsible to the Council on Environmental Quality.

The Working Group includes specialists in various fields of pest control. Agencies representing the group are the Departments of Defense; Interior; State; Agriculture; Commerce; Transportation; Health, Education, and Welfare; and the Environmental Protection Agency (EPA).

The Working Group has observers from the offices of Science and Technology, Management and Budget, Intergovernmental Relations, the Council on Environmental quality and the National Science Foundation.

One of Interior's representatives is an environmental specialist from the Commissioner of Reclamation's office. This representative serves on the Working Group's Program Review Panel which reviews all Federal pest control programs. The panel evaluates the effectiveness of the programs on the basis of their benefits and risks to man, wildlife and the environment. The panel then makes recommendations to Working Group.

by **ROY H. BOYD**, Chief, Water Operations Branch
Division of Water and Land
Bureau of Reclamation, Washington, D.C.

Prohibited List

Some old pesticide standbys, such as amitrol for control of Reed Canarygrass and cattails, and DDT for killing mosquitoes and flies, are now on the "Prohibited List." The chemicals on this list are not used in the pest control programs of Interior agencies because there is concern that they may have a detrimental effect on man or nontarget plants and animals.

Restricted List

Other pesticides, such as organic arsenical compounds for control of Johnsongrass, cyanide compounds and 1080 (sodium monofluoroacetate) for control of rodents and paraquat for use on wild oats and other annual weeds, are on a "Restricted List." These may be used only in special instances where target conditions and application methods are considered by the Working Group on Pest Management and approved by it, provided its use is also consistent with Departmental guidelines. The lists of both prohibited and restricted pesticides are subject to change. The current lists are shown in tables 1 and 2 respectively.

All pesticides (herbicides, insecticides and rodenticides) must be registered by EPA for specified purposes and conditions of use, as described on the container labels, before they may be shipped in interstate commerce. One of the following conditions must exist for registration to be allowed: (1) The residue is not harmful, (2) there is a negligible amount of residue, or (3) that a finite tolerance limit has been established. A tolerance is the determination of allowable pesticide residues in parts per million (p.p.m.) which can be contained in a crop, in animal tissue or product (i.e. chicken eggs, cow milk), or in water and not constitute a hazard to man, nontarget animals or plants.

TABLE 1.—Prohibited List of Pesticides

Aldrin	2,4,5-T
Amitrole	Dieldrin
Arsenical compounds (inorganic)	Endrin
Azodrin	Heptachlor
Bidrin	Mercurial compounds
DDT	Strobane
DDD (TDE)	Thallium Sulfate
	Toxaphene

TABLE 2.—Restricted List of Pesticides

Aramite	Endosulfan
Arsenical compounds (organic)	EPN
Azinphosmethyl (Guthion)	Ethion
Benzene hexachloride	Kepone
Carbophenothion (Trithion)	Lindane
Chlordane	Methyl Parathion
Coumaphos	Mevinphos (Phosdrin)
Cyanide compounds	Mirex
Demeton	Nicotine compounds
Diazinon	Paraquat
Dioxathion	Parathion
Diquat	Phorate (Thimet)
Disulfoton (Di-Syston)	Phosphamidon
DN compounds, such as	Picloram
Dinitroresol	Sodium Monofluoro- acetate (1080)
Dursban	Temik
	TEPP
	Zectran

Restricted Use Near Water

A number of pesticides have been registered for use on crops or land, but few are cleared for use under the aquatic conditions existing around canals and reservoirs. One reason is that manufacturing companies register pesticides in greatest demand and, by comparison, there is not a large market for pesticides for use in aquatic areas and the profits on their sales often are small. Considerable time and funds are needed for research to determine tolerances for pesticides.

Since private industry has been reluctant to register herbicides for aquatic weed control, some Federal agencies have been forced to enter the research field. Reclamation is presently working with the Agricultural Research Service (Department of Agriculture) and the Bureau of Sport Fisheries and Wildlife to obtain tolerance data on 2,4-D (2,4-Dichlorophenoxyacetic acid) and xylene for use in aquatic areas.

Elimination of certain effective pesticides will not necessarily cause a regression to the late 1940's when weed control was primarily a manual job of cutting and removing canal weeds.

In most cases, there are alternatives more acceptable to the environment, although they may be more expensive and less effective on the specific target.

There is a real need for newer and better pesticides that are safe to use. However, the time (6-10 years) and the expense (as high as \$10 million) of developing new products, with no assurance they



Top: Numerous man-hours were required to remove these weeds along the irrigation lateral before chemical control methods were available.



Center: The application of aromatic solvent (xylene) into the canal prevents growth of aquatic weeds which restrict flow of water.

Bottom: Helicopters are often the most effective means of applying herbicides for vegetation control because they can be used along drains and other areas sometimes inaccessible to other spray equipment.





This mobile equipment with adjustable spray booms is used to apply herbicides on weeds along irrigation canals and drains.

will be acceptable to EPA, discourages many manufacturing companies from undertaking such work.

Restricted Use on Federal Lands

A recent example of pest control restrictions affecting a Reclamation project is Executive Order 11643, issued by the President on February 8, 1972. Concerned with mitigating damage to animals on Federal lands, this order forbids the use of any chemical toxicant for the purpose of killing predatory mammals or birds on Federal lands or the use of any chemical toxicant which will have a secondary poisoning effect. The latter includes the use of 1080 which may be fatal to carrion eaters (such as foxes, coyotes, or eagles) feeding on animals killed by this poison.

Guidelines to implement Executive Order 11643 were issued by the Department on May 23, 1972. The guidelines authorize use of zinc phosphide, strychnine alkaloid and certain fumigants for small mammal damage control under conditions which would preclude secondary poisoning effects.

When the order was issued, it was evident that conditions in parts of the Klamath project adjacent to the California-Oregon State border were conducive to a field mice population explosion. Although the expected eruption did not occur, the success of using second choice, zinc phosphide, was minimal compared to what would have happened if Compound 1080, the preferred chemical, had been used as in former years.

Compound 1080 was successful in controlling the mice on privately owned lands in the vicinity. Executive Order 11643 allows for exceptions only when it is necessary to: (1) protect human life, (2) protect an endangered species, or to (3) prevent serious damage to a nationally significant natural resource. Such exception could not be claimed for conditions on the Klamath project even though leaselands owned by the Federal Government were involved.

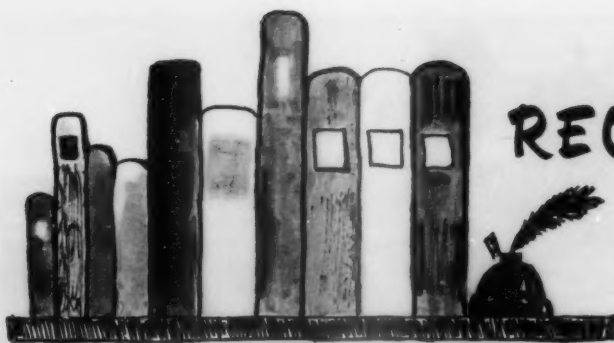
Research Is Needed

Great need exists for more research on pest control especially to establish tolerances for pesticides used under aquatic conditions. Also, more studies are required to compare, on both an economic and environmental basis, the benefits and disadvantages of pest damage control in specific situations.

We all favor pollution control. And there are situations where pests, such as weeds, become pollutants and are detrimental to an aesthetic environment and to the health and welfare of man. Mosquitoes and flies can become real health hazards and burrowing rodents can endanger canal structures and crops, hence they must be controlled.

The ideal pesticide would be cheap, safe and effective—and make both the producer and the environmentalist happy. Unfortunately, this doesn't exist in many situations of pest control; therefore, users and research scientists must continue to search for pesticides that will do the most good for all interests.

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RECLAMATION'S LIBRARY

EDITOR'S NOTE:

As part of our effort to keep *Reclamation Era* readers abreast of publications dealing with water resources conservation and development, we will be running this section, "Reclamation's Library" to inform you of what is available on the subject.

Any contributions to our library should list the publication title, cost, address from where it may be obtained and a short synopsis of the content. Send information to: Editor, *Reclamation Era*, Department of Interior, 18th and E Streets NW., Washington, D.C. 20240.

Thesaurus of Water Resource Terms. (\$3.25) Published by the Bureau of Reclamation, this book contains more than 6,500 technical and scientific words.

The 339-page soft-cover volume measures 8 by 10½ inches, and is available at Government Printing Offices or by writing: Bureau of Reclamation, Engineering and Research Center, Attention: Code 922, Building 67, Denver Federal Center, Denver, Colo. 80225 (payment must accompany order).

These publications may be obtained from the U.S. Department of the Interior, Bureau of Reclamation, Engineering and Research Center, Denver, Colo. 80225:

"Evaluation of Effect of Impoundment on Water Quality in Cheney Reservoir," Research Report No. 25, 1971 (\$1).

Water quality of new plains-type reservoir, measured with physical, chemical, and biological data. Emphasis on salt balance and use of multiple outlets to control quality of water released to Wichita, Kans.

"Evaluation of Soil-applied Herbicides for Vegetation Control," Research Report No. 22, 1970 (0.45¢).

Wet and dry herbicides applied to weed control problems of irrigation and power operations, resulting in more efficient herbicides and reduced maintenance costs.

"Western U.S. Water Plan, 1971 Progress Report," (no charge).

A brochure explaining the 1968-authorized plan to study future water needs of the 11 Western States. To be culminated in 1977, the Westwide Study considers weather modification, water desalting, and reuse of waste water among the means of using and augmenting existing resources.

"Skywater," 1971 (no charge).

A brochure describing progress in precipitation management during the first decade of Bureau of Reclamation's cloud seeding research.

NEWS NOTES

Reclamation Adjusts Organization

The Bureau has adjusted its organization to comply with the Federal standard regional boundary pattern. Present regional and field offices have been maintained and the impact on personnel has been minimal.

Secretary Morton directed all Department of the Interior bureaus and offices to establish common regional boundaries to conform as closely as practicable to the 10-region Federal organization President Nixon outlined in 1969. The objective is to facilitate interagency coordination.

The new organization takes into account that the Bureau's basic responsibilities are confined to the 17 Western States and its regions have been arranged along major drainage lines.

Physical boundaries of the regions and headquarters' locations remain the same. The Bureau no longer identifies its regions by seven numerical designations, but they are designated respectively: Pacific Northwest, Mid-Pacific, Lower Colorado, Upper Colorado, Southwest, Upper Missouri, and Lower Missouri (see map).

Coordination responsibilities in Federal Regions VI and X are assumed by the Reclamation Regional Directors located at Amarillo, Tex. and

Boise, Idaho respectively. A Reclamation Regional Coordinator is to be stationed at Denver, Colo. to handle responsibilities for Federal Regions VII and VIII, while a Coordinator at Sacramento, Calif. will handle responsibilities for Federal Region IX.

U.S.S.R.-U.S. Technical Exchange Mission

A United States team concerned primarily with high voltage transmission of electricity returned August 5 from a 2-week exchange visit to the Union of Soviet Socialist Republics.

Commissioner Ellis L. Armstrong, chairman of the United States Committee of the World Energy Conference, said the group visited the central power dispatching centers in Moscow and eastern Siberia, where it viewed substations, transmission lines and the 800-kv direct current system emanating from Volgograd.

"These exchange visits are not only helpful in providing an exchange of technical information between the two nations, but also in furthering the cause of world peace through better understanding of mutual scientific and technological problems," the Commissioner reported.

TO OUR READERS

We would like to hear from you! If you have suggestions for articles you would like to see in the *Era*, if you would just like to air an opinion about the magazine, or perhaps you have an original cartoon dealing with water, send us a letter.

Send responses to: Editor, *Reclamation Era*, Department of Interior, 18th and E Streets NW., Washington, D.C. 20240.

Answers to Water Quiz

1. d=domestic, i=industrial, r=recreational, h=hydroelectric, m=municipal; 2. b; 3. a. This sample was under tension for approximately 28 hours before failure occurred; 4. False. Food from the sea is limited, we may get only 2.5 times that being produced now; 5. True (*Resources and Man*, Committee on Resources and Man, National Academy of Science—National Research Council).



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